# N.A.C.A. BULLETIN

In Two Sections

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## EDITORIAL DEPARTMENT NOTE

Standard cost articles are usually of more than average interest. From the point of view of the development of standards and variances, the first article of this issue does an unusually fine job. In some respects the article is a cooperative venture. William Drewry presented this case study before a Birmingham Chapter study group and again at the University of Alabama. Harry Faull, Harvey Snook, and Ed Crosta, all of Birmingham, collaborated with the author in the preparation of the written article.

THOMAS B. NOBLE is Assistant Treasurer of the Stockham Pipe Fittings Co. He is a C. P. A. in Alabama, having had extensive experience in public accounting. Currently he holds the office of President of the Birmingham Chapter.

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The *Bulletin* of January 15, 1947 contained an article by Philip Kramer on "Selling Overhead to Inventory." This article, like some earlier ones, proposed the so-called "direct cost plan" calling for the elimination of fixed costs from inventories. Our second article in this issue should serve as a practical illustration of the proposals made by Mr. Kramer.

CECIL L. CLARK, Secretary-Treasurer of the Sangamo Electric Co., is an Illinois C. P. A., and a graduate in accounting from the University of Illinois. He is a Past President of the Decatur Chapter.

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In the third article of this issue, an expert on trucking costs describes how techniques used by the trucking industry can be adapted to the trucking-cost problems of manufacturing and commercial companies. Perhaps it will stimulate experts in other specialized areas to make their knowledge more generally available.

J. FRANK DICKSON, JR., in addition to being Vice President of the H. B. Church Truck Service Co., is Cost Consultant to the New England Motor Rate Bureau, Inc. In 1943-4 he conducted an intensive study of motor transportation costs for the Board of Investigation and Analysis of the ICC. He has participated, as a representative of the motor transportation companies, in many hearings before the ICC and other regulatory bodies.

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NATIONAL ASSOCIATION OF
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# THE CASE OF A STANDARD COST PLAN

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"THE Case of a Standard Cost Plan" is not a murder mystery, but it can be as intriguing, providing one is interested in the possibilities for cost control and cost reduction which are inherent in the intelligent use of standard costs. A case study has its limitations; however, in the discussion of standard costs it is probably one of the clearest methods of presentation. In the development of this case study the attempt was made to make it just as simple as possible to illustrate the manner in which a standard cost system works, from the time engineered basic* standards of measurement are developed until the final analyses are made of the variances from standard arising in the actual operation of the system. Although a steel rolling mill has been selected for this hypothetical example, it is felt that the principles involved are so fundamental as to be applicable to any type of business.

Before actually going into the mechanics of the system, it should be emphasized that the cost-incurring center or department must be clearly defined, in order to place responsibility for costs. One of the most important functions of the system is to measure performance. This involves placing of responsibility and pointing out to the responsible party the results of his efforts. The development of this clear-cut line of demarcation also carries with it the need for more analyses than would have been necessary if the system did not point the finger of responsibility directly to the operator and say "Thou art the man." It will be observed from the case study under discussion that it provides for more or less automatic analyses.

The examples given are only indicative of what can be accomplished; the applications of the principles involved are almost limitless in number. The main point is that these semiautomatic analyses can be built into the system at strategic points to bring out information which will be of real use in directing attention to good or poor performance..

* The term "basic" is used in this paper in its dictionary sense of fundamental, not in its technical sense as indicative of basic or measurement type of standard cost system.

### *Nature of Standard Costs*

In the writer's opinion, standard costs are estimated cost-values used for asset valuation and control. These estimated values, however, must be developed on a scientific basis through the use of time studies, product specifications, etc., so that they represent performance under normal conditions. As actual or historical costs are accumulated, they are measured against the standard costs with the differences or variances being analyzed as to cause of incurrence in order that necessary corrective action may be taken when warranted.

Although some systems develop monetary standard costs based on past performance, the writer believes that standard costs should be established by the application of monetary values to engineered basic or quantitative standards for all items of cost for which such standards can be practicably determined. Of course, it is recognized that items such as miscellaneous operating supplies are such a small component of cost that dollar standards are sufficient.

Basic standards are the expected units of time and estimated physical quantities of materials, labor, utilities, etc., required to produce a given quantity of finished product and should preferably be established by industrial engineering techniques through time studies of actual operations, product specifications, etc. Exhibit 1 illustrates how some of the standards are developed.

### *Material and Labor Allowances*

The first item in Exhibit 1 is the material quantity and labor time required to produce one ton of finished product. Although not shown in the example, it is necessary to establish the various losses (scrap, scale, cinder, and finally unaccounted-for loss) between the semifinished material and the finished product for the purpose of analyzing the cause of improved or deteriorated yield.

The next item in Exhibit 1 represents the components of the operating turn. The latter is a term used to designate an operating shift and it indicates an operation of a specified number of hours, usually eight. Because one cannot expect to operate for a full turn without encountering delays, it is necessary to determine what proportion of the total time should be utilized in producing the product and what proportion may be expected to result from normal delays. While only two types of delays are exhibited it is necessary to break down this item, depending on the type of operation, so that a complete analysis can be made similar to the analysis of material yield.

## BASIC STANDARDS

1. Semifinished material usage and labor time allowances

| Product | Net tons material (billets) per net ton of finished product | Per cent yield | Operating turns per net ton of finished product |
|---|---|---|---|
| A | 1.087 | 92 | .01 |
| B | 1.111 | 90 | .02 |
| C | 1.136 | 88 | .03 |

2. Established standard components of an operating turn

| Component | Per cent |
|---|---|
| Rolling (producing) | 85 |
| Delays: | |
| Setup time | 10 |
| Other | 5 |
| Total | 100 |

3. Standard volume

| Product | Standard net tons per month | Operating turns per net ton of finished product | Standard operating turns per month | | | |
|---|---|---|---|---|---|---|
| | | | Total | Rolling | Delays: Setup | Delays: Other |
| A | 1000 | .01 | 10.00 | 8.50 | 1.00 | .50 |
| B | 250 | .02 | 5.00 | 4.25 | .50 | .25 |
| C | 167 | .03 | 5.00 | 4.25 | .50 | .25 |
| Total | 1417 | | 20.00 | 17.00 | 2.00 | 1.00 |

4. Labor (crew quota) required

| Occupation | Man hours per operating turn |
|---|---|
| A | 32 |
| B | 24 |
| C | 40 |
| D | 64 |
| Total | 160 |

5. Other items

In order to present this case study in a simplified manner, other items such as utilities, fuels, major operating supplies, etc. have purposely been eliminated. Of course engineered quantitative standards must be developed for such items of cost.

EXHIBIT 1

### *Standard Volume*

Since we must have a basis for determining the absorption rate for those costs, which are of such a nature that we should expect them to remain fixed, we must determine the expected or standard volume. In addition to the use of monthly standard volume in tons for the purpose of determining the rate of absorption of the fixed monthly costs, it also becomes the basis for establishing the standard monthly schedule by extending the tons by the time required to produce one ton of finished product. The monthly operating schedule is necessary for two reasons:

1. It establishes the number of direct supervisors per month where foremen are required for each operating turn during a twenty-four hour day.
2. It establishes the number of operating and idle turns per week.

The latter is essential in the development of product costs because such items as fuels and utilities vary depending on the number of consecutive idle turns. As an example, temperatures of furnaces for heating steel vary with the length of time between the operating turns.

### *Standard Labor Required*

We are now ready to develop the amount of direct and indirect labor required. This standard is established from time and method studies and is expressed in man hours per operating turn and detailed by individual occupations for costing purposes.

The above procedure exemplifies some of the standards for the rolling or producing cost center. In the same way basic standards are developed for all other cost centers. While the unit or budget determinant in this example is operating turns, other cost centers will have different units, such as man hours of service rendered, quantity of material handled, etc., depending upon what unit best expresses the factor for measuring activity and performance.

### *Dollar Standards*

As previously explained, basic standards are developed for all cost centers for all items which can practicably be expressed quantitatively. Exhibit 2 covers the development of dollar standards and presents the various items of expense at standard rates and also standard charges from other cost centers where similar basic stand-

## DOLLAR STANDARDS

1. Labor:

| Occupation | Man hours per operating turn | Wage rate per hour | Standard labor cost per operating turn |
|---|---|---|---|
| A | 32 | 1.20 | 38.40 |
| B | 24 | 1.10 | 26.40 |
| C | 40 | .94 | 37.60 |
| D | 64 | .90 | 57.60 |
| Total | 160 | — | 160.00 |

2. Services:

| | | |
|---|---|---|
| Amount per month | $200 | |
| Standard turns | 20 | |
| Standard cost per turn ($200 ÷ 20) | | $ 10.00 |

3. Misc. operating supplies:

| | |
|---|---|
| Standard cost per turn | $ 5.00 |

4. Supervisory charges:

| | | |
|---|---|---|
| Amount per month | $800 | |
| Standard turns | 20 | |
| Standard cost per turn ($800 ÷ 20) | | $ 40.00 |

5. Depreciation:

| | | |
|---|---|---|
| Amount per month | $250 | |
| Standard turns | 20 | |
| Standard cost per turn ($250 ÷ 20) | | $ 12.50 |

6. Taxes

| | | |
|---|---|---|
| Amount per month | $100 | |
| Standard turns | 20 | |
| Standard cost per turn ($100 ÷ 20) | | $ 5.00 |

7. Total Conversion Cost:

| Item | Rate per turn Fixed | Variable | Total |
|---|---|---|---|
| Supervisory charges | $40.00 | — | $ 40.00 |
| Labor | | $160.00 | 160.00 |
| Services | | 10.00 | 10.00 |
| Misc. oper. supplies | | 20.00 | 20.00 |
| Depreciation | 12.50 | — | 12.50 |
| Taxes | 5.00 | — | 5.00 |
| Total | $57.50 | $190.00 | $247.50 |

Material cost $30.00 per net ton (Standard from other department or purchase price)

Scrap $15.00 per net ton.

EXHIBIT 2

ards have been developed. These dollar standards as reflected in Exhibit 2 represent the application of dollars to the basic standards. Certain items of expense in Exhibit 2 are not covered by basic standards. These include miscellaneous operating supplies, taxes, and depreciation and are established only as dollar values. Although depreciation is expressed only in dollar standards it is necessary to have the basic standard for the estimated life of the equipment included in the specified boundaries of each cost center. Of course, the item of taxes represents a dollar standard based on the best obtainable experience and forecast of the future.

***Individual Dollar Standards***

In the development of dollar standards the first item of cost is that of labor. Here the man hours of the basic standards are evaluated at the current wage rates per hour for each individual occupation to obtain the total labor cost per operating turn. The exhibit shows that the standard labor cost is $160 per operating turn.

The next item of expense is that of the service crews which are charged to the producing cost center at standard rates per man hour of service rendered. Basic standards set forth the amount of services to be rendered for a standard month and consequently are reduced to a standard operating turn.

Following the item of services is the item of miscellaneous operating supplies, which is the cost of such supplies for which basic standards are not developed, as previously explained. This cost comprehends such items as lubricants, tools, tape, waste, light globes, etc.

Supervisory charges against this cost center consist of the charges for supervision from the general plant office. They are fixed monthly amounts which are charged to all recipients on a fixed monthly basis. This basis is used so that the effect of all changes in volume of business will be reflected at the producing cost centers. In Exhibit 2 note that the supervisory cost center charges the producing cost center $800 per month or $40 per operating turn at standard volume of production.

Since depreciation and taxes are set up as fixed monthly amounts there is little need for further discussion, as both expenses are reflected in the same manner as the supervisory charges.

In addition to the dollar standards for cost above, it is necessary to develop standard material prices which should be developed by

STANDARD UNIT PRODUCT COST

| | Units per net ton of finished product | | | Dollar standard | | Standard cost per net ton of finished product |
|---|---|---|---|---|---|---|
| *Product A:* | | | | | | |
| Material | 1.087 | N. T. | × | $ 30.00 | = | $32.610 |
| Scrap credit | .087 | " | | 15.00 | = | 1.305 |
| Net metal | 1.000 | " | | | = | 31.305 |
| Conversion cost | .01 | Turn | × | 247.50 | | 2.475 |
| Total | | | | | | $33.780 |
| *Product B:* | | | | | | |
| Material | 1.111 | N. T. | × | $ 30.00 | = | $33.330 |
| Scrap credit | .111 | " | | 15.00 | = | 1.665 |
| Net metal | 1.000 | " | | | = | 31.665 |
| Conversion cost | .02 | Turn | × | 247.50 | | 4.950 |
| Total | | | | | | $36.615 |
| *Product C:* | | | | | | |
| Material | 1.136 | N. T. | × | $ 30.00 | = | $34.080 |
| Scrap credit | .136 | " | | 15.00 | = | 2.040 |
| Net metal | 1.000 | " | | | = | 32.040 |
| Conversion cost | .03 | Turn | × | 247.50 | | 7.425 |
| Total | | | | | | $39.465 |

EXHIBIT 3

the person responsible for purchasing, if the material is purchased from outside parties, and should be based on current market prices. If received from another department or plant within the company, the standard cost for that department or plant is used. Scrap prices may be determined on the basis of market or usable value depending on whether the scrap is sold or used.

We have now covered the development of basic standards and their evaluation to derive dollar standards for costing products. These dollar standards are shown as conversion cost per turn and material cost per ton. Next, it is necessary to convert these dollar standards to a cost per unit of product. The latter will be used for evaluating inventory, determining sales prices, making profit estimates, etc., and are shown in Exhibit 3. This exhibit shows how the standard cost per unit of product is assembled. By extending

ACTUAL EXPERIENCE FOR HYPOTHETICAL MONTH

| | |
|---|---|
| 1. Production (in net tons): | |
| Product A | 776 |
| Product B | 388 |
| Product C | 194 |
| Total net tons | 1358 |
| 2. Cost: | |
| Labor | $ 3559 |
| Services | 233 |
| Supplies | 485 |
| Supervision | 1200 |
| Depreciation | 250 |
| Taxes | 100 |
| Conversion Cost | $ 5827 |
| Material | $44507 |
| Scrap Credit | 1941 |
| Net Metal | $42566 |
| Grand Total Actual Cost | $48393 |
| 3. Operating time (elements): | Turns |
| Rolling turns | 20 |
| Setup time | 1 |
| Delays | 1 |
| Operating turns | 22 |

EXHIBIT 4

the unit quantities from Exhibit 1 at the dollar standards shown in Exhibit 2, the standard cost per net ton of finished product is determined. The details in Exhibit 3 are shown for each product.

### *Cost "Absorption" and Variances*

The development of basic and dollar standards with their subsequent conversion to costs per units of product being completed, we are now ready to apply these standards to actual experiences for a hypothetical month. The latter are shown in Exhibit 4. Cost absorption and variances are developed in Exhibit 5.

The actual production and actual costs are accumulated from various source records, that is, daily or turn production reports, labor abstracts, material requisitions, etc. The cost values shown

## STANDARD EARNINGS AND VARIANCES FOR MONTH

1. Earnings—total:

| Product | Actual net tons produced | | Standard cost | Value of product |
|---|---|---|---|---|
| A | 776 | × | 33.780 | $26213 |
| B | 388 | × | 36.615 | 14207 |
| C | 194 | × | 39.465 | 7656 |
| Earned cost value | | | | 48076 |
| Actual cost | | | | 48393 |
| Total variance (loss) | | | | $ 317* |

*Red

2. Earned turns:

| Product | Production | | Turns per net ton | Earned turns |
|---|---|---|---|---|
| A | 776 | × | .01 | 7.76 |
| B | 388 | × | .02 | 7.76 |
| C | 194 | × | .03 | 5.82 |
| Total | 1358 | | | 21.34 |

3. Earned elements of time:

| Element | Std. dist. of time* | | Earned turns | Standard turns |
|---|---|---|---|---|
| Rolling | 85% | × | 21.34 | 18.14 |
| R & P Change | 10 | × | 21.34 | 2.13 |
| Delay | 5 | × | 21.34 | 1.07 |
| Total | 100% | | | 21.34 |

*From Exhibit 1.

4. Earned Elements of Conversion Cost:

| Element | Earned standard turns | Rate per turn | Earned standard cost |
|---|---|---|---|
| Labor | 21.34 | $160.00 | $3413 |
| Service | 21.34 | 10.00 | 213 |
| Supplies | 21.34 | 20.00 | 427 |
| Supervision | 21.34 | 40.00 | 854 |
| Depreciation | 21.34 | 12.50 | 267 |
| Taxes | 21.34 | 5.00 | 107 |
| Total | | | $5281 |

5. Earned metal:

| Product | Prod. | Standard material per net ton prod. | Standard net tons consumed | Standard cost per net ton | | Standard value |
|---|---|---|---|---|---|---|
| A | 776 | 1.087 | 843.51 | | | |
| B | 388 | 1.111 | 431.07 | | | |
| C | 194 | 1.136 | 220.38 | | | |
| Earned gross metal | | | 1494.96 | $30.00 | — | $44849 |
| Less production (Exhibit 4) | | | 1358.00 | | | |
| Earned scrap | | | 136.96 | 15.00 | — | 2054 |
| Earned net metal | | | | | | $42795 |
| Total earned cost (as above) | | | | | | $48076 |

EXHIBIT 5

in Exhibit 5 for services, supplies, and materials represent the actual quantity used evaluated at the standard rates. As charges are based on actual quantities evaluated at standard rates, price variances are not reflected in the producing department, for the very good reason that the foreman of the producing department has no control over the prices paid for these items. He does, however, have direct control of the quantities of material, labor, and services used. Thus, with the effect of price fluctuations eliminated, the responsibility for variances due to usage is clearly shown.

Note from Exhibit 5, item 1, that the earned cost value of products produced during the month, which is the debit to inventory, amounted to $48,076. Actual costs, that is actual usage at standard cost rates, amounted to $48,393, leaving a debit balance of $317 in the manufacturing control account. The debit balance is known as a loss variance and is debited directly to the profit and loss account.

***Analysis of Variances***

As a basis for analyzing the results, we must first develop, as noted in Exhibit 5, item 2, the standard allowed turns by products and in item 3 the standard elements of time. The standard turns allowed are evaluated at the standard rate per turn to develop the allowed or budget cost. The net tons produced are multiplied by the standard quantity of material required per net ton of product to develop the standard material quantities allowed. These quantities are then priced at the standard cost per ton, resulting in a standard value of material allowed.

It is now the accounting department's responsibility to present to management the results of operations and to develop the cause of the $317 loss variance in such a way that unfavorable costs may be brought under scrutiny so that necessary corrective measures may be taken. Exhibit 6 reflects the standard earnings, the budget allowed, the actual cost, and the type of variance by elements of cost. It will be noted that under the elements of supervision, depreciation, and taxes, a fixed amount is allowed in the budget for each instead of the standard earnings. This is done as the foreman of this department has little control over the absorption of fixed expense. However, for informational purposes, the volume variance of $322 is shown.

OPERATING STATEMENT

1. Operating statement:

| Material | Standard earnings | Budget Fixed | Budget Var. | Actual cost | Variance Volume | Variance Performance |
|---|---|---|---|---|---|---|
| Gross material | $44849 | | $44849 | $44507 | | |
| Scrap ..... | 2054 | | 2054 | 1941 | | |
| Net metal.... | $42795 | | $42795 | $42566 | | $229 |
| Conversion | | | | | | |
| Labor ..... | 3413 | | 3413 | 3559 | | *146** |
| Services ..... | 213 | | 213 | 233 | | *20** |
| Supplies ..... | 427 | | 427 | 485 | | *58** |
| Supervision .. | 854 | $1200 | — | 1200 | *$346** | — |
| Depr. ..... | 267 | 250 | — | 250 | 17 | — |
| Taxes ..... | 107 | 100 | — | 100 | *7* | — |
| Total ..... | $48076 | $1550 | $46848 | $48393 | *322** | 5 |
| Net variance (per Exhibit 5) | | | | | *317** | |

*Red

EXHIBIT 6

***Analysis by Causes***

The over-all cost results of operations having been presented to management, we now analyze variances still further for possible corrective action of any unfavorable results. This is possible only by finding the causes of the variances (Exhibit 7) and informing management of these causes through the use of a classified summary with necessary remarks to cover outstanding items.

The standard turns are compared to actual turns and the resulting turn variances, developed by elements of time, are evaluated at the standard variable rates. That is, the mill was allowed 18.14 rolling turns and actually required 20.00 turns, resulting in a 1.86 turn variance loss. This 1.86 turn variance is costed at the standard cost of $160 for labor, $10 for services, and $20 per turn for supplies. The total result reflects a loss due to excess use of rolling time of $354. The variance gain of 1.13 turns for setup time results in a gain of $215. A gain of .07 turns in delay time likewise results in a gain of $13. The cost value of these items is subtracted from the total variances incurred and gives a remaining amount that must be analyzed through reference to the payroll sheets, material requisitions, etc.

It will be seen in the summary of variances of Exhibit 7 that the total variance of $317 has been segregated into six causes of incurrence. Between the largest loss of $354 and the largest gain of $229 there is a spread of $583 within a total variance of $317.

## ANALYSIS OF COST VARIANCE

| | Cost per turn | Total | Rolling | Setup time | Other delays | Efficiency |
|---|---|---|---|---|---|---|
| Standard turns ..... | | 21.34 | 18.14 | 2.13 | 1.07 | — |
| Actual turns ..... | | 22.00 | 20.00 | 1.00 | 1.00 | — |
| Variance turns ..... | | *.66** | *1.86** | 1.13 | .07 | — |
| Labor ..... | $160 | *$146** | *$298** | $181 | $11 | *-$40** |
| Services ..... | 10 | *20** | *19** | 11 | 1 | *13** |
| Supplies ..... | 20 | *58** | *37** | 23 | 1 | *45** |
| Supervision ..... | Fixed | — | — | — | — | |
| Depreciation ..... | Fixed | — | — | — | — | |
| Taxes ..... | Fixed | — | — | — | — | |
| Total Conversion Cost ..... | 190 | *224** | *354** | 215 | 13 | *98** |

## SUMMARY OF VARIANCES

| Causes of variance | Amount | |
|---|---|---|
| Rolling (Rate of production) ..... | *$354** | (A) |
| Setup time ..... | 215 | (B) |
| Delays ..... | 13 | |
| Efficiency ..... | *98** | |
| Total ..... | *$224** | |
| Metal used (Exhibit 6) ..... | 229 | |
| Volume (Exhibit 6) ..... | *322** | |
| Total (per Exhibits 5 and 6) ..... | *$317** | |

Explanation of variances:

(A) *$354**—Below standard production rate caused by use of size 3 × 3 billets in lieu of use of size 4 × 4 billets as provided in standards.

(B) $215 —Due to larger orders than provided for in standards, fewer setups of machinery were required.

(C) *$ 98**—*$40**—Labor—One extra laborer used for one week for general plant cleanup.

*$13**—Services—Replacement of one conveyor roll on billet conveyor.

*$45**—Supplies—Above standard use of mill guides occasioned by breakage.

* Red

EXHIBIT 7

This lends emphasis to the necessity for developing detailed analyses by causes in order to exercise maximum control of costs through the use of a standard cost system.

The budgets reflected in this example are based on normal conditions. However, should current conditions warrant, budgets for presentation to lower levels of management may be developed with allowances covering these current conditions in order that variances, both favorable and unfavorable, may be promptly classified by responsibility for control. Sometimes special budget allowances must be made to reflect the effects of numerous small orders instead of normal sizes of orders, or overtime premium required by contract, etc.

***Conclusion***

The writer has attempted to avoid as many work sheet details as possible and yet present the case study in such a manner that a minimum of questions may be left unanswered. However, in order to obtain the maximum benefit from a standard cost system, not only prompt presentation and analysis of results are necessary, but correctness of all detailed information and calculations is imperative.

In conclusion, it must be remembered that a standard cost system, although based on principles that do not change, is always in a state of change. As actual conditions vary, new techniques or machinery are introduced, there immediately arises the need for measurement. It is the function of a live standard cost system to furnish this measurement. To be effective in the control of costs, reports and analyses must bring out causes of variations from standard while the facts are fresh, and important features or deviations must be headlined in a manner similar to that followed by your daily newspaper.

# FIXED CHARGES IN INVENTORIES

by CECIL L. CLARK, Secretary-Treasurer,
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THE purpose of this paper is twofold: (1) to lend support to the theory that fixed charges should not be included in inventory values in the conventional manner, and (2) to pass on to the members of the National Association of Cost Accountants the experiences of one company that has followed this theory in the preparation of monthly statements for top management for the past six years.

### *Conventional Profit and Loss Statement*

One of the main reasons for adopting the direct cost method (as later defined) was to eliminate the headaches of statements such as the one shown in Exhibit 1.

| | January | February |
|---|---|---|
| Sales | $300,000 | $300,000 |
| Cost of sales | | |
| Labor | $ 60,000 | $ 60,000 |
| Material | 90,000 | 90,000 |
| Manufacturing overhead | 96,000 | 96,000 |
| Under- or overabsorbed burden | (5,400) | 8,100 |
| Total cost of sales | $240,600 | $254,100 |
| Gross profit | $ 59,400 | $ 45,900 |
| Selling expense | $ 20,000 | $ 20,000 |
| General and administrative expense | 19,000 | 19,000 |
| Total operating expenses | $ 39,000 | $ 39,000 |
| Net profit before Federal income taxes | $ 20,400 | $ 6,900 |

EXHIBIT 1

This statement is prepared in accordance with accepted principles of accounting and the inventory is valued at cost or market, whichever is lower. But just try to explain it to the boss. Sales were identical for the two months, both in units and dollars, yet the profit for January is $13,500 more than for February. Yes, the variation in profit is accounted for by the difference between overabsorbed burden for January and underabsorbed burden for February, but which profit figure is right? Which figure should be accepted as a guide in steering the ship? What percentage of profit

can be expected on volume of $300,000 per month? Of course, the accountant can explain that production was above normal in January and below normal in February, but such an explanation is not very convincing to the boss.

The trouble is that probably the boss is either a salesman, a production man, or a trained engineer who might have started out on a small scale with a few employees, a foreman, a stenographer, but no bookkeeper. He was his own bookkeeper. He knew that he had to pay the foreman, the stenographer, and the rent, and after that he got paid. These were his fixed charges which totaled $400 per month. He knew that his out-of-pocket costs were $60 per unit and his selling price was $100. His gross margin *before* fixed charges was therefore $40 per unit. The thing uppermost in his mind was that he had to produce and sell ten units per month to pay his fixed charges. The gross margin on all over ten units per month was his compensation. He searches in vain in our accounting statements for some semblance of this fundamental principle which guided him in his early days, but obviously he cannot find it because generally accepted principles of accounting make the presentation of this principle a bit difficult. Instead, he finds the statement cluttered up with under- and overabsorbed burden.

### *Direct Cost Profit and Loss Statement*

If the boss were insistent on a profit and loss statement consistent with his appreciation of the *facts* of the business, the direct cost method would do the trick. It is based on the following assumptions:

1. That there are certain indirect manufacturing expenses which are so closely tied in with manufacturing operations that they will slide up and down with the rate of production. These out-of-pocket costs constitute what is termed variable overhead. (Examples: job bosses, setup time, shop clerks, truckers, manufacturing supplies, etc.).

2. That the balance of manufacturing overhead consists of items which in the aggregate remain relatively constant and do not fluctuate with moderate changes in the level of operations. These expenses are called fixed manufacturing charges (Examples: salaries of factory superintendents, production clerks, payroll clerks, time study men, depreciation, millwrights, storekeepers, etc.).

3. That inventory valuation should consist of direct labor, direct material and variable overhead only.
4. That fixed manufacturing charges should be regarded as costs to "keep the doors open" and should be written off in the period incurred.

The profit and loss statements for the two months prepared in accordance with the direct cost method would have appeared as in Exhibit 2.

| | January | February |
|---|---|---|
| Sales | $300,000 | $300,000 |
| Variable cost of sales | | |
| Labor | $ 60,000 | $ 60,000 |
| Material | 90,000 | 90,000 |
| Variable overhead | 36,000 | 36,000 |
| Total variable cost | $186,000 | $186,000 |
| Gross margin before fixed charges | $114,000 | $114,000 |
| Fixed charges | | |
| Factory fixed expense | $ 54,000 | $ 54,000 |
| Selling expense | 20,000 | 20,000 |
| General and administrative expense | 19,000 | 19,000 |
| Total fixed charges | $ 93,000 | $ 93,000 |
| Net operating profit | $ 21,000 | $ 21,000 |

EXHIBIT 2

Both of the foregoing statements were prepared from the following basic data:

| | January | Per cent to productive labor | February | Per cent to productive labor |
|---|---|---|---|---|
| Productive labor for the month | $66,000 | | 51,000 | |
| Variable overhead on production | $39,600 | 60% | $30,600 | 60% |
| Fixed overhead | 54,000 | 82% | 54,000 | 106% |
| Total manufacturing overhead | $93,600 | 142% | $84,600 | 166% |
| Manufacturing overhead capitalized in inventory at predetermined burden rate of 150% | 99,000 | | 76,500 | |
| Under (or over) absorbed burden | (5,400) | | 8,100 | |

The predetermined burden rate of 150 per cent employed in capitalizing manufacturing overhead to inventory during the months of January and February was established from the budget analysis which anticipated annual productive labor of $750,000 and manufacturing overhead of $1,125,000 (Variable overhead of $450,000 or 60 per cent of productive labor and fixed overhead of $675,000 or 90 per cent of productive labor). Inasmuch as manufacturing overhead for the previous year was 160 per cent of productive labor, the burden content of the closing inventory was valued at that rate and sales for January and February were costed with a burden rate of 160 per cent on a first-in first-out basis. The analysis of the inventory account is shown in Exhibit 3.

It will be noted that the direct cost profit and loss statement for the two months completely ignores the fixed overhead component of inventory valuation. The computation of cost of sales for the two months has been as follows:

| | January | February |
|---|---|---|
| Inventory, beginning of month at variable cost ..... | $744,000 | $762,600 |
| Variable cost of production for the month ..... | 204,600 | 151,600 |
| Total variable cost ..... | $948,600 | $914,200 |
| Inventory, end of month at variable cost ..... | 762,600 | 728,200 |
| Variable cost of sales for the month ..... | $186,000 | $186,000 |

The question that we accountants must answer is "What is wrong with the boss' profit and loss statement?" Is the criticism that the inventory has not been valued at cost or market, whichever is lower, and that the statement is not in accordance with accepted principles of accounting a satisfactory answer? Why shouldn't fixed manufacturing expenses which go on with time regardless of production activity be regarded as expenses in the period incurred? How can we justify our method of deferring these fixed charges through the use of a predetermined burden rate which creates profits or losses on production? How can we accountants continue to permit the boss to question our sanity by clinging to this device which can cause the paradox of decreased profits on increased sales? We are the first to recognize and have often pointed out to top management that on increased volume profits increase at a faster rate than sales. In other words, if operating profit is say 10 per cent on normal sales, the percentage on

ANALYSIS OF INVENTORY ACCOUNT

| | Labor | Material | Variable overhead at standard per cent | Total variable cost | Fixed overhead | Total burden at standard per cent | Per cent to labor | Total | Fixed charge component of inventory fluctuation |
|---|---|---|---|---|---|---|---|---|---|
| Inventory—12/31/46 ..... | $240,000 | $360,000 | $144,000 | $744,000 | $240,000 | $384,000 | 160% | $ 984,000 | |
| Production for January ..... | 66,000 | 99,000 | 39,600 | 204,600 | 59,400 | 99,000 | 150% | 264,000 | |
| Total Available ..... | 306,000 | 459,000 | 183,600 | 948,600 | 299,400 | 483,000 | | 1,248,000 | |
| Cost of Sales for January*.. | 60,000 | 90,000 | 36,000 | 186,000 | 60,000 | 96,000 | 160% | 246,000 | |
| Inventory—1/31/47 ..... | 246,000 | 369,000 | 147,600 | 762,600 | 239,400 | 387,000 | | 1,002,000 | $ 600 |
| Production for February .... | 51,000 | 70,000 | 30,600 | 151,600 | 45,900 | 76,500 | 150% | 197,500 | |
| Total Available ..... | 297,000 | 439,000 | 178,200 | 914,200 | 285,300 | 463,500 | | 1,199,500 | |
| Cost of Sales for February*.. | 60,000 | 90,000 | 36,000 | 186,000 | 60,000 | 96,000 | 160% | 246,000 | |
| Inventory—2/28/47 ..... | $237,000 | $349,000 | $142,200 | $728,200 | $225,300 | $367,500 | | $ 953,500 | $14,100 |

* See Exhibit 2.

EXHIBIT 3

the incremental volume, unless there is unusual sales effort or price slashing, might run up as high as 30 or 40 per cent. Why shouldn't accounting reflect this established fact in a direct manner?

### *Straddling the Fence*

The problem of presenting a useful profit and loss statement which is still in accordance with accepted principles of accounting is a difficult fence to straddle. Our company has straddled this fence by preparing a statement like the one in Exhibit 2, and has modified it as follows:

| | January | February |
|---|---|---|
| Net operating profit | $21,000 | $21,000 |
| Fixed charge component of inventory fluctuation | (600) | (14,100) |
| Net taxable income | $20,400 | $ 6,900 |

It will be noted that the figure for "fixed charge component of inventory fluctuation" is the reconciling figure between the profit under the direct cost method and the profit computed in accordance with accepted principles of accounting. It is also the difference between the beginning and ending inventory of fixed overhead as shown on Exhibit 3. This figure is, of course, frowned on by the members of top management, but they realize that it is only a concession by the accountant to his conscience and have learned to completely ignore it. They steer the ship and are guided entirely by the caption "net operating profit."

The operating statements have been prepared in this fashion for the past six years. To say that they have been satisfactory is putting it mildly. The management has a break-even chart available at all times. The fixed charges to "keep the doors open" stand out on each monthly profit and loss statement. The boss can easily figure the amount of sales volume needed to produce enough gross margin to cover fixed charges and produce a satisfactory profit. He can directly see the effect of increased volume on the net operating profit figure. Sales above the point where the gross margin on sales is equivalent to total fixed charges will produce operating profit equal to the gross margin on the incremental sales.

### *Pricing the Product*

The profit and loss statement used by our company also shows budget figures for the month and total to date. The direct cost

method eliminates the problem of budgeting profit on production. The sales budget submitted by the sales department is costed at standard labor, material, and variable overhead. Total variable cost of sales is subtracted from budgeted sales to obtain gross margin before fixed charges. The budgeted operating profit is merely the gross margin on budgeted sales less the budget for fixed charges.

A sales analysis schedule is prepared each month which shows the budgeted and actual sales and the budgeted and actual gross margin before fixed charges for approximately twenty product classifications. This plan had been in operation only a short time when it became apparent that there were a number of inconsistencies in the percentage of gross margin produced by the various product classifications. This observation resulted in the development of a new method of pricing the product.

After five years of experience, the selling price is no longer computed under the total cost method. To obtain the selling price, a multiplier reflecting the desired gross margin is applied to factory variable cost. The answer thus obtained is termed the ideal or suggested selling price. It is the selling price used unless the sales department can convince top management that there are compelling reasons why it should be more or less. This selling price is deemed to be a reasonable price that will produce a reasonable profit on a normal volume of business. If sales are above normal, a substantial profit will be made on the incremental sales. If sales are below normal, it is up to management to whittle the fixed charges.

It is recognized that perhaps this pricing method might not work for all companies, but it is worthy of consideration.[1] It is recognized that one of the chief criticisms of the variable cost theory of pricing is that the other factors of cost may be overlooked by the sales department in the computation of the selling price. This problem has been solved by keeping costs in the cost department. The sales department is not told what the costs are; if the sales people are not satisfied with the selling price computed by the cost department, they can take the matter up at a meeting of the pricing committee which is composed of the sales manager, the cost department manager, and a member of top management.

[1] See article entitled "Price Control Based Upon Proportional Cost" by Harry B. Gutman, in *The Controller*, October 1943.

*A Compromise*

The question remains as to what we can do about the valuation of inventory that will give us the benefits of the direct cost profit and loss statement and still present all facts of the business? Some accountants have argued that inventory should be valued at direct labor, direct material, and variable overhead only. This appears, to the writer, to be going overboard unnecessarily and a logical compromise would seem to be at hand which will answer this $64 question.

It must be recognized that a very definite fixed factory expense must be incurred to create a working or normal inventory. Furthermore, essentially the same factory fixed expense must be incurred to create this working inventory regardless of its size, within reasonable limits such as plus or minus 25 per cent. A reasonable calculation of the magnitude of this expense could be based on the total factory fixed expense per annum at normal capacity less incidental expenses unnecessary to the production of goods, such as the company house organ, company sponsored athletic events, guard service, etc.; the net expense divided by the normal rate of inventory turnover should be representative of the going concern or replacement value of the fixed charge portion of inventory. Why is not this figure suitable as a permanent portion of inventory valuation regardless of the variable cost magnitude of the inventory, unless there be some permanent change in the nature of the business or the capacity to produce?

Specifically, the writer proposes that inventory valuation should include this lump sum for factory fixed expense and that this figure should remain constant from month to month and from year to year. It should be evident that so long as this figure is constant no reconciling addition to the direct cost profit and loss statement such as fixed charge component of inventory fluctuation will ever appear, regardless of the magnitude of this permanent assessed valuation for the fixed charge portion of inventory. (Zero valuation of the fixed charge component in inventory as advocated by some accountants is thus merely a special case and, the writer contends, an illogical one).

Of course, one might ask "What if physical inventories approach zero? Would you still value the fixed charge component at this predetermined amount?" The answer is that inventories of a manufacturing concern do not approach zero. There is always a

minimum inventory of finished parts and partially assembled units in various stages of completion which represents a substantial investment. For a going concern this minimum working inventory is virtually a fixed asset. If the value of the working inventory approaches zero, of course, the inventory is overstated. In such case the value of all fixed assets will be viewed with a glassy eye by the money lenders, because the concern is obviously no longer a going concern.

***Criticism of "Cost or Market, Whichever Lower"***

It is recognized that one criticism of eliminating fixed charges in the valuation of inventory is that such a method causes profits to fluctuate more widely than the conventional method of including fixed items of factory cost in inventories. The writer's comment to this criticism is that accounting should be a device to show the facts and not a device to level off earnings and level off dividends to stockholders.

Let us pursue this subject a little further to illustrate how our generally accepted principles of accounting perform this "magic sleight of hand" of leveling off earnings between accounting periods. One way is by valuing the overhead component of inventories at cost or market, whichever is lower. Cost generally refers to the cost during the year or period in which the inventory is produced. The cost of the overhead portion of inventory is ordinarily considered to be the percentage of manufacturing overhead to productive labor dollars or a dollar rate applied to productive labor hours. This method allows considerable leeway in pricing the overhead portion of inventories because the reduction of the overhead content of inventories to bring them in line with market value does not happen except in years of extremely low production or unfavorable market conditions. The overhead content is, therefore, virtually valued at cost. In years of high production the percentage of manufacturing overhead to productive labor dollars goes down and in years of low production the percentage goes up. In other words, variation in the operating level of the plant affects the valuation of the year-end inventory. Therefore, the "cost or market" rule permits maximum valuation of inventories at the end of a year when production has been the lowest. Often low production is accompanied by bad times, when conditions may be such that selling prices might have to be scaled down to meet competition. Under such conditions, inventories are valued at a higher value

than at any other time during the business cycle, leaving a minimum profit to be realized through sales. This can well mean that the manager of a business operating under the conventional total cost method of pricing the product may not be able to compete, because he is reluctant to sell his product below inventory cost. He is burdened with fixed expenses of previous periods which have been included in inventory values and have to be written off as cost during this critical period when he is trying desperately to keep the nose of the ship above water and avoid a net loss on the annual report to stockholders. His competitor, on the other hand, operating under the direct cost method of valuing inventories and pricing the product, does not have to worry about fixed expenses of previous periods; they have already been written off in the period incurred. His worries are limited to current fixed charges only, which can generally be scaled down, permitting price reductions to the point where the gross margin over and above out-of-pocket variable costs on anticipated sales will cover the "whittled" current fixed charges (to the break-even point if necessary). Which position would you rather be in? Could it be that we accountants *are* responsible for depressions, unemployment, and the human distress resulting therefrom?

For purposes of illustration, it is believed reasonable to assume that the operating level of most plants can be increased at least 20 per cent above normal capacity. The simplest way is by multiple shift operation. It is further assumed that a decline in the level of operations to the extent of 20 per cent below normal capacity can be sustained without forcing the inventory to be valued at market. The following illustration shows the effect on the percentage of manufacturing overhead to productive labor at these assumed levels of operation:

| | Twenty per cent above normal capacity | Per cent to productive labor | Normal capacity | Per cent to productive labor | Twenty per cent below normal capacity | Per cent to productive labor |
|---|---|---|---|---|---|---|
| Productive labor | $ 900,000 | | $ 750,000 | | $ 600,000 | |
| Variable overhead | 540,000 | 60% | 450,000 | 60% | 360,000 | 60% |
| Fixed overhead.. | 675,000 | 75% | 675,000 | 90% | 675,000 | 113% |
| Total burden.. | $1,215,000 | 135% | $1,125,000 | 150% | $1,035,000 | 173% |

This illustration further assumes that the labor content of a normal working inventory is $240,000, which is the December 31, 1946 inventory shown in Exhibit 3. Under the cost or market rule, the overhead content of the same physical inventory would be costed

at a different value at the end of each year: (1) when operating levels were normal, the value would be $360,000; (2) when operating levels were 20 per cent above normal, the value would be $324,000; and (3) when operating levels were 20 per cent below normal, the value would be $415,000. Inventory valuation directly affects the annual profit, which means that in periods of high production profits are scaled down $36,000, and in periods of low production profits are boosted by $55,000. This is one way by which accepted principles of accounting level off earnings. To the layman this is probably gibberish. The purpose of this lengthy discussion is to point out to the belligerent adversaries of the direct cost method of valuing inventories, that "He who lives in glass houses, should not throw stones." One just criticism of the above illustration can be made by the normal capacity proponents, who maintain that the cost of idle plant capacity should not be included in inventory values. Their contention would be that the burden content of inventory values should not exceed 150 per cent of the productive labor content. However, even with a ceiling of 150 per cent, the fact still remains that inventories are at higher values in periods of low production than during periods of high production because the public accountant will not permit inventories to be valued at 150 per cent when costs show 135 per cent.

***Responsibility of the Public Accountant***

Probably the lion's share of responsibility for our accepted principles of accounting rests with the public accountant whose primary responsibility is to the "money lenders" and to the public investor. The public accountant has developed most of our accounting conventions and concepts in an effort to present a balance sheet which properly reflects asset values. The profit for the year is the difference between the value of the net assets at the beginning of the year and at the end of the year. On the face of it, this sounds very reasonable, but the emphasis is on the valuation of assets and liabilities and the profit and loss statement is secondary. Admittedly, the banker has to be interested in the current ratio; however, he is also interested in earning ability. He must find many shortcomings in our conventional profit and loss statement in his endeavor to determine potential profits. Why should the profit and loss statement be a residue of the balance sheet? It is contended that if the banker were presented with a balance sheet showing the variable cost of inventories accompanied with an oper-

ating statement showing budgeted sales, fixed charges, and gross margin before fixed charges, he would be able to make a more intelligent analysis than can be obtained from an orthodox statement in which production gains or losses are a part of cost of sales.

It is recognized that the method of valuing inventories for purposes of reporting earnings to stockholders does not have to be the same as that used for federal income tax purposes, but if they are not the same another paradoxical situation is created; namely, that in some year the stockholder's profit and loss statement may show an operating loss plus a federal income tax liability.

### *Conclusion*

In conclusion it must be mentioned that the substance of this article is by no means an innovation of the writer. The write-off of fixed charges to current operations was advocated by Mr. Jonathan Harris in the *N. A. C. A. Bulletin* of January 15, 1936, and again by Mr. Clem N. Kohl in the *N. A. C. A. Bulletin* of July 1, 1937. With the end of the war and the return to peacetime production, with competitive markets on the horizon, this subject again becomes most important. In the writer's opinion, the sooner the direct cost method is recognized by the accountant, the sooner the accountant will be recognized at the conference table of top management.

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**COMING ARTICLES**

**In the *N. A. C. A. Bulletin*, May 1, 1947**

**Cost Reduction**
by Thomas D. Foy

**Accounting in the Flour Milling Industry**
by Ralph C. McKibbin

**An Incentive Plan for Chain Store Managers**
by R. L. Urban

# DETERMINATION OF TRUCKING COSTS

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MANY manufacturing and commercial companies operate motor trucks. However, trucking is usually a more or less incidental part of the operations which these companies engage in, and measurement and control of trucking costs has consequently received somewhat less attention than the control of manufacturing and selling costs. The more progressive motor transportation companies, on the other hand, are vitally interested in trucking costs, for their very existence may depend on decisions which are made largely on the basis of intelligently determined costs. Consequently, these trucking companies have developed techniques of cost finding and cost control which are considerably more advanced than those used by most private carriers (i.e. companies which operate trucks for their own purposes, but not for hire) in connection with their trucking operations. It is likely, therefore, that accountants who are only incidentally concerned with trucking costs can profitably study the techniques developed by trucking-cost specialists.

Trucking companies have three principal uses of cost information. First, cost is an important (although not the only) factor in the determination of rates. Second, the control of costs is essential if operations within the established rate structure are to be carried on at a profit. Third, many policy decisions relating to the expansion of facilities, the type of service offered, and the choice of equipment and methods are guided by cost information. Accounting systems have been devised that will yield the total costs and unit costs required to meet these purposes. These systems employ the same fundamental principles that are found in any good cost accounting structure, and the only modifications are those required by the special nature of the business and of the information required.

### *Functional Classification of Costs*

Many common-carrier truckers provide a pick-up and delivery service using relatively small vehicles which pick up the freight and bring it to a terminal where it is sorted and loaded onto larger vehicles for shipment to the terminal nearest the destination. At the second terminal, the freight is then reloaded on the smaller

trucks used for delivery. In such an operation, there are three main classifications of operation costs:

1. Line-haul costs.—These include the costs of the large trucks which carry the consolidated shipments from one terminal to another.
2. Pick-up and delivery costs.—These include the costs of the small vehicles used to pick up freight from the shipper, and to deliver it to the consignee.
3. Terminal costs.—These include the maintenance and operation of the terminal building, the loading, unloading, and temporary storage of freight, and the office expense involved in rating, revising, billing, and collecting.

When a shipment is moved in one truck directly from the shipper's door to the consignee there is, of course, no pick-up and delivery cost and very little terminal cost; most of the cost of these shipments falls within the line-haul classification.

In addition to these three operating classifications, there is a fourth functional division consisting of general administrative costs. It will be noted that the first three classifications are analogous to the departments or cost centers into which manufacturing costs are commonly divided. The fourth classifictaion is in the nature of general overhead and, like overhead, it is reallocated to the three operating classifications for costing purposes.

***Line-haul Costs***

Line-haul costs consist of costs which are related to vehicles, costs which are related to persons (drivers), and a prorated portion of general administrative costs. The two principal factors affecting vehicle costs are distance and time, and a trucker's cost records provide for a strict separation of these two factors. Certain items of expense are directly related to time and continue whether or not the vehicle is in motion. Depreciation, vehicle insurance (including fire, theft, property damage, and public liability), licenses, and taxes are examples of items of this nature. Other expenses are factors of use and are incurred only when the vehicle is moving. Examples are gasoline, oil, servicing, outside repairs, and tire and tube expense.

Trucking companies usually record the operating cost of each unit of their fleets. In grouping costs together, they are careful to

include only those of like units of equipment to prevent inclusion of dissimilar units in the same average cost figure. The operating cost of a gasoline-operated truck is not included in the same average with the cost of a diesel-operated truck, for example. Units of equipment are also grouped according to their use. Line-haul equipment is recorded separately from pick-up and delivery equipment, and equipment is also segregated according to the different types of country (rolling, flat, mountainous, and so forth) in which it operates.

***Mileage Costs***

In addition to the individual items of expense such as gasoline, oil, servicing, outside repairs, repair parts, repair labor, shop expense, tires and tubes, the mileage operated by each vehicle is recorded so that the total running expense per mile is readily ascertainable. The importance of keeping running costs for each unit of equipment cannot be overestimated; such figures are the principal means by which management maintains control over equipment, operating cost, and maintenance. A comparison of over-all figures for the entire fleet made at the end of a year may show that the average cost per mile for maintenance, or for gasoline, or for some other item has increased over the preceding period. These average figures, however, will not indicate which unit of equipment was responsible for the increase. They will not point out which type of operation is the more expensive, nor will they indicate the changes that occurred in the cost of any particular operation during the year. These important questions can all be answered by a comparison of the mileage costs of individual units. If, for instance, repairs for an individual truck are too high, it may be an indication that this truck should be disposed of, or that it has outlived its usefulness for the particular type of service for which it has been used, and should be transferred to some less strenuous use. Excessive gasoline and oil charges may indicate the need for a motor overhaul or possible dishonesty on the part of the driver of the particular truck. Excessive repairs and tire and tube replacement not warranted by the mileage operated may suggest the possibility of "raw-hiding" of the equipment by the driver. The very amount of the total expenditures recorded for outside repairs may focus attention on the desirability of expanding the operations of the repair department to include a larger part of this function within the organization itself.

At the close of each period the mileage costs of individual units are arranged so that all trucks of a comparable size and operation are posted to the same account; the total of all these expenses, divided by the total number of miles traveled, gives an average figure of the cost of operating this type of equipment per vehicle-mile. This average figure is entirely different from the average figure that would have resulted from a grouping of all equipment and all operations in the same average.

### *Vehicle Time Costs*

Certain items of cost in the operation of motor trucks are dependent solely upon time and not upon the number of miles operated. They continue at the same rate per hour whether the truck is moving or standing. Accountants in trucking companies differ on the question of whether depreciation should be included in this classification. Some companies charge it on a time basis; others, on a mileage basis. The decision depends somewhat on the nature of the operation, but in most cases it is simply a matter of choice and either method will give satisfactory results.

Fixed costs are charged to operations on the basis of "per truck-hour operated," which is practically the same as a manufacturing burden rate. This rate is usually established annually. The total fixed costs anticipated for the ensuing year frequently can be estimated with a fair degree of accuracy. Similarly, the number of hours that the different units will be operated during the year is also estimated. If the business is seasonal, the estimates are set up on a monthly basis with allowances for the different conditions anticipated in the several seasons. The fixed charges are reduced to a per-hour basis by dividing them by the number of productive hours of operation estimated for the year. If the estimates are carefully made, there will be only a small difference between the total amount of fixed charges applied by the per-hour rate and the expenses which are actually incurred as operations progress.

### *Over- and Underapplied Time Costs*

At the end of the year adjustments are made to allow for underapplied time costs or overapplied time costs. Adjustments sometimes are made on a monthly rather than an annual basis to promote greater accuracy. This requires comparison of the estimates with the actual charges for the vehicle as they develop. If, for example, such a comparison should reveal a discrepancy between

the estimate and the actual record for January, then the whole operation is reviewed. If it appears that the error will be corrected in February so that the actual will approximate the estimated total, there is no need for revision. If, however, it seems likely that the error will be carried on the books throughout the year or that the discrepancy will be cumulative, increasing or decreasing with the passage of time, then the entire schedule would be revised and the necessary adjustments made. Otherwise, the estimated figures would not be comparable with those of actual operation and the amounts of fixed charges to be adjusted as underapplied or overapplied at the end of the year would be too large for practical use.

If this type of correction is not made as soon as the facts appear to justify the change, the cost figures may be misleading. If, for example, the number of hours the equipment has been in operation during a certain period has been overestimated and the error is not corrected, the result will be an estimated cost per hour for fixed charges which is too low. Rates based upon this cost will not be sufficient to cover the actual cost of operation regardless of their adequacy in covering the estimated cost of operation.

### *Taking Business at a Loss*

It might be argued that if these estimated costs were adjusted and then made the basis of rates, the resulting rates would be so high that business would be lost. Under such a condition the carrier would be in a sounder position if it rejected the losing operation in the first place, unless there were some cogent or expedient reason for desiring that particular business. There might be competitive factors justifying a carrier's handling such business even at a loss; if so, the wise operator would be realistic and accept the business with the knowledge that the result would be a loss which he would endeavor to offset by expected future gains. The operator might also decide that the additional business would contribute to a partial absorption of the fixed charges and that without this partial absorption his total profit would be less. If this were true and the revenue derived from the operation (whether a particular run or the movement of a particular commodity) did not cover the full cost of performing the service, it should be recognized that the business in question was being handled at a loss even though it contributed to an absorption of overhead and even though the total profit was greater with this operation than without it.

The ability to know when a particular job is a losing venture is a valuable asset in estimating future business. An opportunity to utilize the full amount of the equipment on a fully allocated cost basis might arise even after certain of the current operations have been eliminated. In such an instance the business that should be discarded is that which is not sufficient to cover the fully allocated cost and provide a profit. In other words, if the costs of a given operation are known, managerial policies can be formulated intelligently and the operations can be adjusted to fit various conditions as they arise. If, however, the costs are not known, or if the operator is deceived as to the true amount of the costs, he cannot be sure until the end of the year that the operation has been profitable. Even then it is too late to reap the full benefit of advantages that would have been his had he pushed certain classes of business or discarded others at different times during the year when the opportunities arose.

***Advance Estimates***

In the situation described, the actual use of the equipment, in terms of hours operated, was less than the estimated use, and the result was a corresponding increase in the actual hourly rates of the fixed charges. Had the actual use been greater than the estimated amount and had it appeared that the conditions would prevail during the balance of the period for which the estimate was contemplated, it would have been equally important that the time rate be revised downward. If the estimated hourly cost had been used, this estimated cost would have been higher than the actual cost, and if rates had been based on these costs, business might have been lost which otherwise would have been obtained.

If the predetermined time costs are approximately correct, there will be little difficulty in making a substantially correct advance estimate of the vehicle costs for any given movement of freight. In computing the total mileage or running cost for a given movement, it is only necessary to multiply the cost per mile by the number of miles and the time cost by the estimated number of hours the run will consume and then to add the wage expense (described in the following paragraph) to the results. The sum of the three items will be the total vehicle cost for the given movement.

***Drivers' Wages***

Drivers' wages are not included with vehicle fixed or time expenses because wages are different in nature from the items of

depreciation, insurance, taxes, and general overhead. The latter items of expense are related to time and increase or decrease per hour according to the number of vehicle hours of operation; that is, the greater the number of hours of operation in a given period, the less will be the cost per hour. If drivers are paid on an hourly basis, the wages paid, although a set amount per hour, vary directly with the number of driver-hours worked.

Wages, therefore, are segregated from fixed time costs and are grouped with compensation insurance and social security taxes. Compensation insurance and social security taxes vary directly with the wages and are parts of the variable hourly costs of operating vehicles. These wages include only those paid the drivers; the remuneration of service and shop personnel is a part of the mileage expenses and is treated as being variable with the miles operated by each truck. Social security taxes and compensation insurance likewise should be recorded separately for the different classes of labor, and only that part of each which is applicable to the drivers should be included in the variable vehicle hourly expense.

### *Pick-up and Delivery Costs*

Pick-up and delivery costs involve the same three cost elements as line-haul costs; that is, costs related to time, costs related to mileage, and the so-called variable time costs, such as drivers' wages. The same principles that have already been outlined in the preceding section apply here, and a detailed discussion of these costs would therefore be largely repetitious. The essential point to keep in mind is that it is extremely important to separate pick-up and delivery costs from line-haul costs in the accounting system. The equipment, the type of operation, and hence the cost factors, are quite different, and if these two kinds of cost are not segregated, the aggregates in the accounts will be meaningless. Furthermore, not all shipments require pick-up and delivery service, and an analysis of the cost of these shipments cannot be made unless the cost of such service is segregated.

### *Terminal Costs*

In the movement of freight by motor truck there are, aside from the vehicle-operating cost, the expense of loading and unloading full truckload movements, and the expense involved in handling, sorting, and consolidating less than truckload shipments for line-

haul transit. In order to maintain effective control over the terminal costs of operation, careful records are kept for each terminal. These records show the man hours and cost of terminal handling, the cost of billing and collecting, and the terminal overhead expense.

Terminal handling expense consists of the cost of labor necessary to handle freight across the terminal platform. This labor cost includes the cost of moving the freight across the terminal platform; loading and unloading line-haul trucks; weighing the freight, and checking bills of lading, number of shipments, and weight. Costs for workmen's compensation insurance, social security taxes, and any other direct expense traceable to terminal handling are also included in the labor cost.

Billing and collecting expense consists of the labor cost necessary for rating, revising, and billing freight bills, and for collecting payment for the service rendered. Included in this expense are the pertinent costs of stationery and printing, postage, workmen's compensation insurance, social security taxes, and any other expense incident to billing and collecting.

Terminal overhead consists of items of terminal expense which cannot be charged directly to either of the foregoing categories. It includes salaries of terminal agents, foremen, and watchmen, workmen's compensation insurance and social security taxes, terminal real estate taxes, building and equipment depreciation, terminal supplies and incidental expenses, light, water, heat, repairs, and rent.

The terminal costs also reflect a proportionate share of general overhead expense. General overhead expense is not to be confused with terminal overhead expense. All terminal overhead expenses are charged directly to terminal operations, whereas general overhead expense is apportioned among all the operations.

***Control of Terminal Handling Costs***

The cost of handling freight within a terminal and the cost of picking up and delivering from that terminal is ordinarily stated in units of 100 pounds in order to have a unit of cost by which the expense of the terminal may be held in line and in order to obtain unit costs for pricing and planning purposes.

The poundage accounting for each terminal segregates the pounds coming into the terminal in line-haul vehicles, in pick-up

vehicles, from connecting lines, and by customers' deliveries to platform. The disposition of the freight through further forwarding, delivering, connecting line, and delivery to customers at platform is also recorded.

Control of platform expenses requires an analysis of the handling problem in each terminal. Such problems may vary greatly because of the number of handlings necessary to initiate, complete, or forward freight. At some locations single handling may be used almost exclusively, and at others double handling or even triple handling may be necessary. It is evident that the platform cost will be greater in a terminal where double handling is frequently required than in a terminal where most of the freight is given only one handling. Accordingly, a comparison of terminal platform costs is not effective unless the actual volume handled is shown and stated in terms of cost per hundredweight and pounds handled per person.

***Computing Handling Costs***

If a record of all incoming poundage is kept by the use of manifests, the number of handlings in the terminal may be obtained by marking these manifests to show the handling apparently required by the poundage. If, for example, it is practical to unload directly from a pick-up vehicle into a line-haul vehicle, one handling is indicated; if the freight must be unloaded to the terminal platform, two handlings are indicated. The same is true of poundage received from line-haul vehicles. Some portion of it may be loaded directly to delivery vehicles, some may be left in the line-haul vehicle for delivery or further forwarding (there is no handling in this case), and some must be unloaded to the platform for delivery or further forwarding. When the proper notation is entered on the manifest at the time all incoming vehicles are unloaded, the handling problem is simplified, and the record can be kept with reasonable accuracy.

The handling cost in a terminal is computed by dividing into the total platform cost the sum total of all the pounds handled. The last item is, of course, the actual pounds handled once plus double the actual pounds handled twice, and so forth. For example:

| | | | |
|---|---|---|---|
| Pounds loaded directly to other vehicles | 500,000 | = | 500,000 |
| Pounds unloaded to platform ..... | 600,000 | = | 1,200,000 |
| Pounds actually handled ..... | Platform cost | = | Handling cost |
| | 17,000 | | per hundredweight |

The foregoing formula may be changed to meet special situations, such as additional handling entailed in the shifting about of packages on the platform. The tabulation of pounds actually handled will be most useful when it is prepared by types of shipment. The information may be compiled, for example, on a basis of pick-up runs, singly or by groups or areas, or however required. Separate compilations for receipts from customers at the platform and for those from connecting lines are often made. Such information is useful in the control of loadings, as an indication of the necessity for additional platform space, and in consideration of many problems which arise in the administration of a terminal platform. Where wage scales vary at different terminals, the reasonableness of one handling cost compared with another may be indicated by the differences in the number of pounds handled per person on the platform.

***General Administrative Costs***

Included in this final cost category are the salaries of general officers, the expenses of the general offices, legal expense, auditing expense, and any items of expense which cannot be charged directly to the three operating classifications. Since these costs are in the nature of general overhead, they must be reallocated to the three operating classifications (line-haul, pick-up and delivery, and terminal). The usual basis of allocation is the total direct expense of the operating classifications. A few companies prefer the direct labor basis, but this is usually not satisfactory since it tends to throw too much overhead cost on the pick-up and delivery operation. The wages of a man driving a half-ton pick-up truck may be nearly the same as that of a man driving a ten-ton diesel, but the amount of overhead attributable to these two operations is certainly quite different.

***Accessory Services***

In addition to rendering transportation services proper, highway carriers in many instances perform other valuable services, the expense of which is recorded separately from the actual transportation expense. For instance, many carriers provide C.O.D. services, provide riggers and helpers and additional labor, store freight, and so forth. The rates or charges for these added services are not included in the basic rates or charges of moving property but are provided for in a separate section of the carrier's tariff or classification.

***Summary of Cost Elements***

A motor carrier's cost accounting structure rests on the following primary accounts, which are in turn broken down into as many detailed accounts as are necessary:

1. Line-haul operations
   a. Costs related to mileage
   b. Costs related to hours of operation
   c. Variable hourly costs, such as drivers' wages
2. Pick-up and delivery operations
   a. Costs related to mileage
   b. Costs related to hours of operation
   c. Variable hourly costs, such as drivers' wages
3. Terminal operations
   a. Terminal handling expense
   b. Billing and collecting expense
   c. Terminal administrative expense
   d. Loss and damage expense
4. General administrative costs
   (prorated among the first three classifications)

***Combining Functional Elements***

After expenses have been properly classified as above they are reduced to a unit basis, using pounds, mileage, or hours as the unit, whichever is appropriate. They are then recombined to give summary information by types of equipment, types of operation, types of service rendered, and shipments handled. These figures make it possible to compare results of one division with those of another, to locate undesirable trends, to set intelligent prices on various types of service, and to determine the relatively profitable and the relatively unprofitable parts of the business.

Thus, management has before it the cost per hundredweight of picking up and delivering in each of its terminals, the cost per hundredweight of passing poundage through each of its terminals, and the line-haul cost per hundredweight of transporting property over each of its operating divisions. By the addition of the appropriate unit hundredweight costs of the divisions affected, the cost of transporting any shipment on the carriers' lines may be determined. In determining the profitability of poundage through the use of these cost figures, variations may be made in the cost of any division affected where that division is not operating at

capacity, or is operating out of equalization, by computing what the cost would be if the proposed poundage were added in a correct amount and in the beneficial direction. For purposes of comparison in determining whether any of the terminal costs are out of line, costs are prepared each period for each terminal.

To the foregoing analysis of pick-up and delivery vehicle costs are added such special studies of pick-up and delivery operations as are deemed necessary to analyze the pick-up and delivery costs of any terminal. These studies will, of course, analyze variations in costs in terms of the number of stops made per vehicle and the time consumed at customers' platforms for loading and unloading vehicles. In connection with these special studies, comparative hundredweight costs may be ascertained after adjustments for the various known physical characteristics of any given area have been made.

### *Adaptation by Other Companies*

At first glance, the cost accounting system used by the motor carriers may seem too complicated to be useful in the control of trucking costs by companies which are engaged in the trucking business only as an incidental part of their main operations. It may be well to point out that progressive motor carriers find it worthwhile to use such a system in addition to the accounting classification which is prescribed by the Interstate Commerce Commission and which is based on a type-of-expenditure principle, without regard to functions. The ICC, for example, requires that all taxes be lumped together in one group of accounts, whereas for cost accounting purposes the various types of tax payments (gasoline, social security, property, etc.), must be regrouped into the functional classification described above. A private carrier would not be handicapped by this ICC restriction, and could set up its accounts on a functional basis in the first instance; it thus could obtain the same results with less effort than the trucking companies have to expend.

### *Costs for Control*

Nontrucking companies would probably derive at least two important benefits from using all, or parts, of the techniques which the truckers use. In the first place, they could obtain information to serve as a basis for the control of trucking costs. In the second place, they could use the basic cost information to assist in making

decisions regarding the proper scope of the trucking activities that they engage in.

For cost control purposes, the principles described above could be used with only such modifications as are required by the nature of trucking work performed by the particular company. These principles—classification of costs by function, use of the proper unit basis (hours, miles, or pounds), comparison of like units of equipment and like activities, etc.—apply equally well to trucking and to nontrucking companies.

***Planning and Rate Setting***

The problem with respect to using the figures for planning purposes is somewhat different. Truckers need the figures as the basis for intelligent rate setting. Nontrucking companies will not need them for this purpose, but they can use cost data in the solution of a closely allied problem, that of deciding how much of the transportation function the company should do itself and how much it should call on established transportation companies to perform. It is a relatively simple matter, once the costs have been classified as described above, to calculate the costs for each type of transportation now being carried on by the company; delivery, long-haul, interplant, and the like. The results of these studies can be compared with the rates of established transportation companies, and the comparison will form a basis for deciding whether all, or part, of the transportation job can be done more efficiently by an outside agency.

It should be emphasized that in many situations it is not necessary to change the present accounting system to accomplish these purposes. The basic information may be obtainable from the existing accounts, and all that needs to be done is to classify it properly, and then arrange it in the proper form. Both of these operations can, of course, be performed outside the books of account.